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PATENT

#8
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: MARKUS WIMMER ET AL.

Serial No.: 09/873,290 Group Art Unit: 3663

Filed: JUNE 5, 2001 Examiner: Ronnie M. Mancho

Title: METHOD AND APPARATUS FOR DETECTING SHOCK ABSORBER DAMAGE

APPEAL BRIEF

Commissioner for Patents
Washington, D.C. 20231

April 22, 2003

Sir:

On January 22, 2003, Appellants appealed to the Board of Patent Appeals from the final rejection of Claims 1, 2, 9, 19 and 20. The following is Appellants' Appeal Brief submitted pursuant to 37 C.F.R. §1.192.

I. REAL PARTY IN INTEREST

This application has been assigned by the inventors to Bayerische Motoren Werke Aktiensellschaft (BMW AG), a German corporation. Accordingly, the parties in interest to the present appeal are the named inventors and the BMW AG.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants, to Appellants' legal counsel or to the assignee which will directly affect or be directly affected by or have a bearing on the Board's Decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-32 are currently pending in this application. Of these, Claims 30-32 have been allowed, and Claims 3-8, 10-18 and 21-29 have been indicated to be directed to allowable subject matter, as set forth in paragraphs 3 and 4 of the Office Action mailed October 23, 2002. Claims 1, 2, 9, 19 and 20 have been rejected. By this appeal, Appellants seek review of the final rejection of the latter claims, based on prior art grounds.

IV. STATUS OF AMENDMENTS

One amendment has been submitted in the present application, dated July 16, 2002, and has been entered.

V. SUMMARY OF THE INVENTION

The present invention provides a novel method for protecting and analyzing wear of a vehicle shock absorber, which can be performed using existing equipment on the vehicle, and does not require removal of the shock absorber from the vehicle for testing purposes. In particular, the inventors have determined that a conclusion can be drawn with respect to shock absorber condition by analyzing the rotational wheel speed signals generated by the wheel speed sensor unit which conventionally exists in an antilock braking system (ABS), in certain frequency ranges. That is, the signals output by the existing speed sensor of an ABS system can be used to generate time varying signals representing either (or both) the rotational speed change Δn of wheel rim or the radius change Δr of the tire. Accordingly, a significant aspect of the invention resides in the proposition that vehicle shock absorber wear can be detected and analyzed based on the rotational wheel speed signals provided by an ABS sensor.

Within the scope of the invention, the inventors have also determined that in the auto power density spectrum for both Δr and Δn, there are frequency ranges ("analysis frequency ranges") in which the spectral values depend on the performance of the shock absorber, and other frequency ranges ("reference frequency ranges") within which the values are essentially independent of shock absorber performance. Accordingly, it is possible to generate a "characteristic shock absorber damage value" which changes when shock absorber performance deteriorates, by comparing (in particular, forming the quotient of) the spectral

values within these two frequency ranges. The characteristic shock absorber damage values are calculated according to equations 5(a) and 5(b), as set forth at page 6 of the application, and is discussed at paragraphs [0016] through [0019], for example.

An analytical device for calculating the shock absorber damage value DSKW is shown in Figure 6. As can be seen, the rotational speed or radius change signals for each of two different frequencies (as discussed at paragraph [0014] through [0018]) are passed through respective band pass filters, maximum and minimum value limiters, and low pass filters. The resultant signals are then divided and passed through a second low pass filter in order to generate the characteristic shock absorber damage value DSKW as defined in equations 5(a) and 5(b). The latter signal can then be used to evaluate the condition of the shock absorber, for example by comparison with a threshold value. (See, for example, Figure 7.)

VI. ISSUES

The issue presented by this appeal is whether Claims 1, 2, 9, 19 and 20 are unpatentable under 35 USC §102(e) as anticipated by Magiawala et al (U.S. Patent No. 6,278,361).

VII. GROUPING OF THE CLAIMS

For the purpose of the present appeal, Appellants respectfully submit that the claims should be grouped as follows: Group I – Claims 1, 9 and 19; Group II – Claims 2 and 20.

VIII. ARGUMENT

The Magiawala et al reference discloses a method and apparatus for monitoring, among other things, shock absorber performance, utilizing as basic input signals "radial acceleration" signals generated by a radial accelerometer 2 or a lateral accelerometer. (See Column 1, lines 58-60; Column 2, lines 31-33 and Column 6, lines 35-37.) Moreover, the disclosure in Magiawala et al is veery clear that what is meant by "radial acceleration" is "the acceleration of the wheel or tire in a radial direction, i.e., in a direction perpendicular to the axis of rotation of the tire." (See Column 3, lines 50-53.) This is, of course, quite different from a rotational wheel speed sensor of an ABS system.

Thus, the basic signal data which are processed in Magiawala et al in order to evaluate the condition of the shock absorber (being related to, for example, upward and downward "bouncing" of the wheel) are fundamentally different from that of the present invention. In particular, Magiawala et al contains no teaching or suggestion of using rotational wheel speed signals generally, or rotational wheel speed signals from an antilock braking system

rotational wheel speed sensor in particular, for the purpose of analyzing shock absorber performance.

In this regard, the Office Action states at paragraph 2 on page 2 that Magiawala et al discloses "detecting wheel speed signals of an antilock braking system rotational wheel speed sensor", referring specifically to Column 7, lines 16-30. However, a careful review of this portion of the disclosure reveals that it in fact teaches away from the present invention in that it suggests a manner in which sensors that sense radial acceleration of a tire can be used "to replace the wheel speed sensors currently being used" in antilock braking systems. (See Column 7, lines 20-25.) This paragraph discloses only that signals indicative of radial acceleration of a tire (as defined previously) can be used in order to determine rotational wheel speed of a vehicle. There is no suggestion anywhere in Magiawala et al, however, that rotational wheel speed signals from a sensor of an ABS system to determine the condition of a shock absorber as recited in Claims 1 and 19. On the contrary, as stated at Column 7, lines 25-30, "if the present invention is incorporated on the vehicle to monitor tread wear, shock absorber performance, and/or balance condition of a vehicle tire, using the system and method of the present invention eliminates the need for wheel speed sensors currently being used and their associated expense."

The Magiawala et al reference simply does not detect or utilize any measurement information regarding rotational wheel speed generally, or, as noted previously, wheel speed signals from an ABS wheel speed sensor in particular, for any purpose at all. Rather, as noted at Column 5, lines 32-35,

"The present invention is based on Applicants' finding that the radial and/or lateral acceleration of the wheel or tire can be used to provide information regarding tread wear, shock absorber performance, balance condition and/or wheel rotation speed."

Since the Magiawala et al reference contains no suggestion of using "wheel speed signals of an antilock braking system rotational wheel speed sensor" for any purpose whatsoever, it cannot anticipate Claims 1 and 19 of the present application.

Claims 2 and 20 further recite that the analysis of wheel speed signals includes a determination of either a temporal course of a radius change Δr of vehicle tire or a temporal course of a rotational speed change Δn of a wheel rim, based on the wheel speed signals. Since the Magiawala et al apparatus contains no provision for measuring or otherwise utilizing rotational wheel speed, it follows that it also fails to teach or suggest a system in which wheel speed signals are analyzed in either of the recited ways. Accordingly, Appellants respectfully submit that Claims 2 and 20 further distinguish over the Magiawala et al reference for this additional reason as well.

IX. CONCLUSION

For the reasons set forth above, Appellants respectfully submit that Claims 1, 2, 9, 19 and 20 of the present application are not anticipated by the

Magiawala et al reference, and are allowable. Accordingly, Appellants request that the Board reverse the final rejection of these claims and allow the present application.

The Commissioner is hereby authorized to charge the appropriate fee of $320.00 to Deposit Account No. 05-1323 (Docket #951/49617). A triplicate copy of this Appeal Brief is attached.

A one month extension of time petition under 37 C.F.R. 1.136(a) is submitted herewith.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #951/49617).

Respectfully submitted,

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APPENDIX

1. A method for detecting shock absorber damage, comprising:

detecting wheel speed signals of an antilock braking system rotational wheel speed sensor; and

determining a condition of said shock absorber by analyzing said wheel speed signals.

2. The method according to Claim 1, wherein the step of analyzing said wheel speed signals includes one of determining a temporal course of a radius change Δr of a vehicle tire, and determining a temporal course of a rotational speed change Δn of a wheel rim, based on said wheel speed signals.

9. The method according to Claim 1, further comprising high-pass filtering of the wheel speed signal.

19. Apparatus for detecting shock absorber damage in a vehicle having an antilock brake system that includes a rotational wheel speed sensor, said apparatus comprising:

a processing unit coupled to receive rotational wheel speed signals from said rotational wheel speed sensor;

wherein said processing unit determines characteristics of a shock absorber by analyzing said rotational wheel speed signals of said antilock brake system rotational wheel speed sensor.

20. The apparatus according to Claim 19, wherein said processing unit includes a component for determining one of a temporal sequence of a radius change Δr of a vehicle tire, and a temporal course of a rotational speed change Δn of a wheel rim, based on said wheel speed signals.